Urban Mobility in the Era of Smart City/Internet of Things (IoT)

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Student Presentation
Mobility

- **Definition**

“The ability to move or be moved freely, easily, and safely”

- Oxford Dictionaries
Internet of Things (IoT)

• **Definition**

“The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data”

- Oxford Dictionaries
What **Smart City applications** or **Internet of Things (IoT)** technologies can **governments** utilize now to improve overall **mobility** in their urban regions?
Potentials of IoT in Transportation

- Traffic Operation
- Transit
- Parking
- Pedestrian Safety
- Bike Sharing
Big Data: To Gain Citywide Visibility in Real-Time

Data Mining & Simulation

Super-computing System

Big Data

Trajectory
Speed
O-D

... Transmission

GPS
smart phones
videos
detectors

Real-World Traffic

Hourly VMT

MARTA speed distribution

Avg speed: 5 mph
Big Data: To Gain Citywide Visibility in Real-Time

CO hourly pollution
I-85@ Jimmy Carter Blvd

On-road hourly energy use
Traffic Operation: Real-Time Monitoring/Evaluation/Decision System

Traffic Condition
- Congestion
- Incident
- …

IoT
- Vehicle sensor
- Detector
- …

Computing Center
- Data mining
- Simulation
- …

Road Users & Control System
- Travel behavior
- Smart signal
- …

Strategy
- Emergency service
- Ride sharing plan
- …

Feedback

Detection

Evaluation

Implementation

Decision
Operating service
- Coordinate vehicle sensors with smart signals
- Real-time schedule broadcasting system
- Demand monitoring

Eco-driving
- Real-time fuel consumption measurement
- Driving behavior monitoring and improvement
- Idling reduction through schedule optimization

Inspection & maintenance
- Performance/configuration data for each vehicle
- Monitoring up-to-date working status
- Automated detection-evaluation-decision strategy

Special Demand
- Emergency: severe weather/vehicle fault
- Additional runs (peak & special event)
- Reaction function
Los Angeles 15-block area

Drove 950,000 miles, produced 730 tons of CO2, and used 47,000 gallons of gas just looking for parking in one year

- Compile spot information to mobile App
- Use App to find an available parking spot and reserve it with a fee
- Minimize traffic congestion, reduce emissions and eliminate labor inefficiencies
Pedestrian Safety

- Smart reflector for pedestrian: blink and alert drivers (Finland)
- Smart traffic lights: warn turning vehicle when pedestrian is crossing

Generating Sidewalk Quality Network
- To get crowdsourced data
- To prioritize maintenance/repair
- To support pedestrian’s routing decisions

Smart reflector  Smart walk system
Bike Sharing

- **Benefits:** flexibility, the “last-mile” travel
- **Challenges:** dynamic demand and asymmetric usage, leading bike sharing to an unbalanced system with biased distribution
- **IoT-integrated bike sharing system:** provide real-time bike supplies, predict demand

**Shared Bike Distribution in London**

- Implement discounted fare strategies
- Encourage rent from spots with surplus bikes
- Encourage park in spots with potentially higher demand with less supplies
References & Contact

References:


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